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0000911-8 19 March 2000 (19.03.2000) SE(71) Applicant (for all designated States except US): **AB EFB, ENERGIFÖRBÄTTRINGAR** [SE/SE]; P.O. Box 1524, S-600 45 Norrköping (SE).

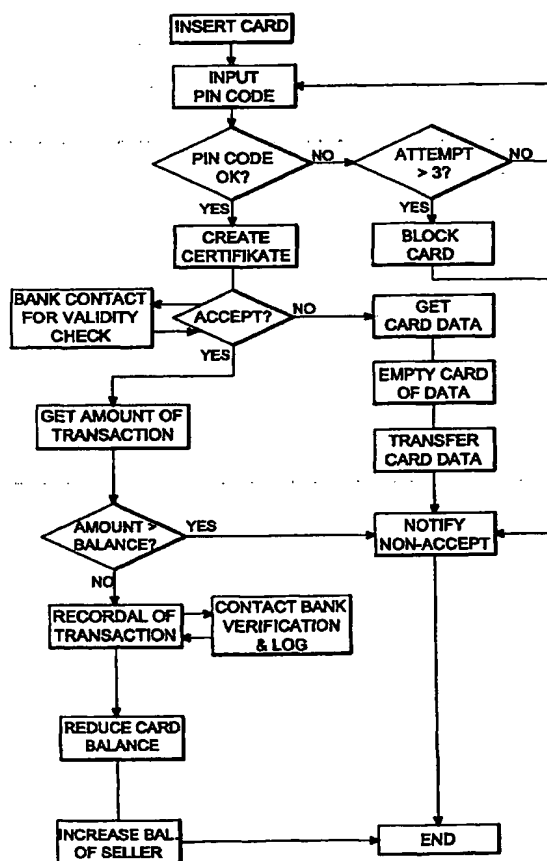
(72) Inventors; and

(75) Inventors/Applicants (for US only): **GRANFELDT, Björn, Christian** [SE/SE]; S:t Persgatan 19 E, 4 tr., S-602(74) Agent: **NORÉN, Per, Bo, Arne**; Swedpatent AB, P.O. Box 186, S-746 24 Balsta (SE).

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(54) Title: **PAYMENT SYSTEM**

(57) Abstract: The invention relates to a payment system utilizing so called "smart cards", which include a microprocessor attached to the card with associated memory circuits for storage of transactions, and which via a terminal can be supplied an available and for the card holder useable amount. According to the invention, a unique card number for said card, together with a PIN code chosen by the user and registered for the card, are transformed by means of the card microprocessor into a unique and preferably encoded user certificate for each individual card, which is used for verification of the authority of the user. Said card includes preferably stored information relating to a maximum level of amount to which the card can be used without stating PIN code, and information relating to the maximum number of such transactions that can be performed without the card communicating and transferring information of executed transaction to the bank holding the account or similar party, such transactions being registered and stored in the memory circuits of the card with a corresponding reduction of available amount. When the card is used in connection with terminals not communicating on-line with account holding bank or similar, transaction data are stored in the memory circuits of the card as well as in the payment terminal, with available amount being correspondingly reduced, and on insertion into a reading terminal directly connected to account holding bank or similar, transfer of in the card stored transactions data takes place for registration/checkup of booked transactions with said bank or similar.

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Payment system

The present invention relates to a payment system, based on the use of so called "smart cards", i.e. cards of credit card type including a microprocessor and having certain memory capacity. The system according to the invention can also be integrated with other existing card payment systems, i.e. credit and pay cards having information stored in a magnetic strip, and also systems such as, for example, Mondex and CashCard.

Payment systems of the type credit or pay cards have been used commonly for a long period of time and result in the possibility to make purchases and other types of payments without cash. However, users of such cards can only to restricted extent perform transactions of a smaller dimension with such cards, e.g. payment of travel with public transport, purchases of newspapers and similar. Further problems are obviously that such cards can be falsified, and that cards lost or in any other way misplaced can be used by unauthorized parties. A further problem is that a card holder can be held responsible for charges related to unauthorized use until a lost card has been disqualified, and also that a new card can not be issued immediately when a card is lost. Trade via Internet also involves problems, since many users are extremely reluctant to state the card number and the period of validity in connection with such transactions, in view of the risk that given information will be obtained by an unauthorized party or in any other way misused. Shop owners and similar accepting these types of payments at present require special purpose terminals in order to obtain relatively high safety when establishing that the cards used for payment have not been closed, and that a possible maximum credit limit is not exceeded. In order to minimize the above problems, cards of the type CashCard have been proposed, i.e. cards with a microprocessor and associated memory which can be "loaded" with a desired amount, e.g. in a bank. However, these cards require a special purpose terminal in the shops or similar accepting this payment procedure, and loss of such a card also results in that stored and unused credits can not be recovered, i.e. loss of such a card is equivalent to loss of the same amount in bank notes. This type of card has therefore not become very successful as a means of payment, and they are also completely unsuitable for certain types of transactions, e.g. payments via Internet. Existing types of cards are also very desirable in connection with robbery and theft.

The object of the present invention is to disclose a payment system which substantially or completely overcomes the disadvantages related to previous systems of payment, i.e. the system according to the present invention results in completely safe payments for the buyer as well as the seller. Furthermore, the system according to the invention is also

adapted for all existing types of transactions, e.g. purchase of low price services or goods, use as a ticket for local public transports, safe payments via Internet, and also many other types of transactions, as disclosed in the following description. A not unimportant advantage is also that the terminals utilized by the system according to the invention are easily adapted to the types of cards as used today, which means that existing card payment systems can be accepted integrated with the system according to the invention. Other card and system links can be created by OEM information on the cards, e.g. in order to use the pay card as an entrance access card, or a card for travel within local public transport, parallel with the normal function of the card.

10

In order to simplify the description, only banks are mentioned below as issuing the cards used according to the present invention, but this term is also intended to include other types of companies offering financial services.

15 The payment system according to the invention utilizes so called "smart cards", which include a microprocessor attached to the card with associated memory circuits for storage of transactions, and which via a terminal can be supplied an available and for the card holder useable amount, from which reduction can be made via a pay terminal when the card is used as a means of payment, and that a unique card number for said card, together with a PIN code registered for the card, are transformed by means of the card micro processor into a unique user certificate for each individual card, which is used for verification of the authority of the user, and is mainly characterised in that said card includes stored information relating to a maximum level of amount to which the card can be used without stating PIN code, and information relating to the maximum number of such transactions that can be performed without the card communicating and transferring information of executed transactions to the bank holding the account or similar party, such transactions being registered and stored in the memory circuits of the card with a corresponding reduction and storage of remaining available amount and remaining number of allowed executable transactions; that said card when used in connection with not directly communicating payment terminals performs storage of transaction data in the memory circuits of the card as well as in the payment terminal; and that said card, when inserted into a reading terminal having direct connection with the bank holding the account or similar party, performs transfer of stored transaction data in the card for registration/checking recorded transactions with said bank or similar, and that preferably also at the same time limit values for total number of transactions allowed without stating PIN code, as well as maximum total amount limit for such transactions, are updated/restored.

The payment system involves the additional advantage that insertion of a non-valid card in an on-line terminal, or a terminal not communicating on-line but having memory stored bar list information relating to blocked cards, results in transfer to the terminal of stored transaction information in the non-valid card, as well as available program software on the  
5 card, which completely or partly is stored in the terminal, or at a directly communicating terminal, is transferred via the terminal; that as a successively following step said information/program software as substantially as possible is erased from the card; and that said obtained information as soon as possible is transferred to the account holding bank or similar with information relating to the identity of the terminal and the time when the  
10 action was performed.

A non-restricting example of a payment system according to the invention, and a number of examples of modifications thereto, will be more fully described below with reference to the accompanying drawings, in which:-

15

Fig. 1 is a block diagram schematically showing how a transaction is performed according to the present invention via a directly connected terminal, and also showing actions in connection with a non-accepted card;

20 Fig. 2 is a block diagram which shows in more detail the check-ups performed for acceptance of a card (at "ACCEPT?" in Fig. 1); and

Fig. 3 is a block diagram which schematically shows a transaction of a value less than an amount (SEK 50) for which a PIN code is required, provided that the number of such  
25 transactions in the shown example does not exceed a predetermined number (N), which is shown as 5 transactions.

The payment system according to the present invention is substantially based on the use of cards having a processor and memory according to the ISO standard for smart cards.  
30 According to the invention, such cards may exist in a number of fashions having different software, adapted to intended field of use. However, said cards may primarily be divided into two main groups as follows.

#### **Transfer cards:**

35 These cards can be used, for example, for transfer of amounts between a mobile and a stationary terminal. They may also serve as a substitute for a bankers cheque or similar means of payment. Furthermore, transfer cards require use of an associated PIN code,

and may also be arranged locked to only function between specific terminals and/or accounts. They may also be used as a substitute for travellers cheques, and also serve as "emptying cards" for terminals intended for various types of machines, such as, for example, payment of parking fees, purchase of soft drinks and similar fields of use.

5

**Pay cards:**

These cards are loaded with money from any terminal connected to the system directly from the bank account of a user. The amount is stored on the card as cryptical information and protected by PIN code. Furthermore, the software of the microprocessor is also read  
10 protected.

The card can be used for payments without activating a PIN code up to a predetermined and relatively low limit, e.g. SEK 50, and for payments exceeding the above limit by stating the PIN code. The number of successively following transactions without use of PIN code  
15 is registered, restricted to a predetermined maximum number, e.g. five, whereafter PIN code is required to complete the transaction. The above stated limited amount and number of transactions would result in that a lost card facilitates maximum use of SEK 250, whereafter the card is blocked for further use. The card is also blocked on repeated input of incorrect PIN code a predetermined number of times, e.g. after three incorrect attempts.

20

The cards may also contain an unlimited amount, but can also be arranged having a maximum upper limit, e.g. SEK 15.000, which is used as an example in the following description.

25 Said maximum upper limit, as well as the number of successively following withdrawals without PIN code, and also the maximum allowed limit for such withdrawals, can advantageously be modified by the user, preferably within certain predetermined levels.

Each single card has a unique identity, which is used for creating certificates, which form  
30 a base for payments made. Said certificates also facilitate that there is a central recordal of unused amounts for each card within the system, and that such unused amounts can be recovered in such a case that a card is lost or blocked against further use. In the latter case a unique certificate for the card is created at the time of blocking, which will credit the bank account of a user the available amount of the card, at the same time as the card is  
35 "emptied" of its content, i.e. same can no longer be used for payments.

A common feature of all cards is that, when blocked, they are locked against further use

when the use of same is not accepted as valid by the bank, or the terminal used. The information collected during such an action is saved for examination, and this is a part of the safety system in order to, at an early stage, prevent attempted attacks on the system, and by analysis locate possible patterns in attempted attacks.

5

The blocking operation can be performed in a number of ways, whereof the following may serve as examples:

- 10 a) The card is stolen or lost. A manual blocking operation is performed on request by the user.
- b) The card is damaged mechanically or in any other way. A manual blocking operation is performed by the user.
- c) Incorrect use, e.g. a transaction card is used in an incorrect type of terminal or by use of incorrect PIN code.
- 15 d) The card has not been used within a certain predetermined period of time, e.g. one year.

With disregard to type of action, a card can be blocked by a report to the bank with information of the card number, or by a report via a shop terminal, requiring proof of  
20 identity and information relating to card number/PIN code. Furthermore, blocking can also be allowed by use of the shop code, combined with proof of identity for the owner, should same forget the PIN code of the card.

When blocking has been performed, the card is placed on a list of barred cards, and de-  
25 activated when placed in a terminal connected to the system. This involves erasing of software and stored data on the card, which data simultaneously (or later) are transferred to the issuing bank.

As previously mentioned, a card should preferably be used within a certain maximum  
30 period of time, e.g. one year, and otherwise be blocked against use. The object of such a feature is to prevent that the lists of blocked cards become infinitely long, e.g. filled with lost cards that no longer are being used. Money available on such cards can thereby automatically be transferred to a new card replacing existing card, which is blocked. Blocked and de-activated cards can obviously be reprogrammed by the bank and re-used.

35

The payment system according to the present invention includes a number of basic functions, which briefly can be stated as facilitating the following actions:

- 1) To make payments up to a predetermined limit (SEK 15.000) via a shop terminal, mobile terminal (SEK 50) or via Internet, when the recipient has terminal software for receipt of payments.
- 2) To make payments between cards, i.e. person-to-person payments.
- 5 3) To make transfers of money to desired bank or account.
- 4) To load the card from a personal computer or any terminal (however, not mobile).
- 5) To change PIN code via personal computer, bank or shop terminal.
- 6) To block a lost card via personal computer, bank or shop terminal.
- 7) To read existing available amount on the card from any terminal, including pocket readers (key ring readers), or to open the card for purchases without PIN code.
- 10 8) To facilitate a loading operation, the amount should exceed a certain minimum amount (e.g. SEK 100 or a corresponding amount in other currency), and that preferably a minimum amount corresponding to the transaction costs (an insurance premium for the transaction) should be available in order to accomplish a purchase.

15

The above mentioned functions facilitate that a user receives access to his money as "semi-cash", i.e. the card can be used to transform electronic money into bank notes and coins, or for payments. This also applies to known pay, credit and bank cards. The money stored on the card is protected from theft and the party receiving payment knows that when  
20 payment is received, the money is available as immediately obtainable cash.

The payment system according to the invention obviously also makes a user non-dependant on the opening hours of the banks, and a special feature is that payments via Internet can be made, without stating the card number. The risk taken by the banks with  
25 regard to card fraud is eliminated, as well as the problems that these can inflict on a card holder. Replacement cards replacing damaged or lost cards can be issued immediately, and with the same amount as was available at the time when the card was damaged or lost. Furthermore, replacement cards can be issued by any bank, a feature that is most desirable, e.g. when one is travelling.

30

The risk for robberies aimed at persons is also reduced, partly due to the fact that the card is protected by a PIN code, partly due to the fact that only a small amount can be obtained without PIN code (SEK 250). Credit balance of mislaid cards is also transferred to the account of the holder after a predetermined period of non-use (e.g. 1 year).

35

The payment system according to the invention includes a number of predefined and basic transaction types, which with regard to functions facilitate further additions to those defined



below:

- a) Payment between cards.
- b) Payment to account.
- 5 c) Transfers from card to card.
- d) Payment of goods/services via an online-terminal.
- e) Payment of goods/services in an Internet shop.
- f) Blocking of card.
- g) Recovery of amount from lost/damaged card.
- 10 h) Transactions via mobile terminal.
- i) Transfer between mobile terminal and bank.
- j) Emptying of card.
- k) Updating of card.
- l) Change of PIN code.
- 15 m) Payment with bank or credit cards via the system.

Without regard to type of transaction, use utilizing a terminal directly connected to the bank involves a verification of the card and a checking operation of card data in relation to bank data. Any earlier transactions, which have not been communicated to the bank, e.g. any  
20 small amount transactions exist stored in the form of a transaction log in the card, are transferred to the bank for registration/bookkeeping before desired transaction is initiated.

The transaction log which exists due to the memory capacity of the card allows a user to perform an estimated number of 64 transactions offline, before used memory capacity has  
25 been exhausted. When approximately 10 further transactions are allowed before existing memory capacity has been completely exhausted, this fact is preferably shown in a display unit of the offline-terminals used, whereby the user is informed of the need to download stored data via a directly connected terminal. The user does not need to make any purchase in the directly connected terminal in order to transfer the log.

30

Even if a card during a long period of time is used only in offline-terminals, information relating to performed transactions will be transferred to the bank in connection with transfer of information to the bank from sellers of goods/services. Furthermore, for each transaction the amount available on the card is reduced by the transaction amount, which means that  
35 no purchase can be made for a larger amount than what is actually remaining.

The above mentioned transaction types (a - m) will now be briefly described.

**a) Payment between two cards**

A payment (transfer) from one card to another is easily accomplished, and when using a terminal without direct connection to the bank, such a transaction can be performed as follows. Card No. 1 is placed in the terminal and amount and PIN code are stated. The  
5 amount is reserved as a withdrawal in card No. 1 and a certificate is issued, which is intermediately stored in the terminal. This is preferably time restricted to a valid period of, for example, 15 minutes. Thereafter card No. 2 is placed in the terminal, which accepts the certificate, whereafter a receipt is issued, which is stored in the terminal. Card No. 1 is placed once again in the terminal, receives the receipt, which is verified by card No. 1.  
10 Available balance for card No. 1 is reduced, the transaction is logged by the card and a withdrawal receipt is transferred to and stored by the terminal. As a final step, card No. 2 is once again placed in the terminal, whereby the amount in question is definitely transferred to card No. 2, which transaction log is updated with transferred amount and information relating to the transaction.

15

For the same type of transaction via Internet or at a directly connected terminal, the transfer can be carried out even more simply by placing card No. 1 in a reader, and by stating amount and PIN code. The card is verified by the bank and the amount in question is reserved as a permanent withdrawal, provided that card number of a recipient is  
20 received in a following step. Created certificate has once again a preferably time restricted period of validity, e.g. 15 minutes, and provided that card No. 2 is placed in the reader during this period of time with input of associated PIN code, the amount is transferred to card No. 2 and the transaction is registered as final and completed.

25 In both of these two cases, the transaction is annulled should card No. 2 fail to be placed in the terminal within prescribed time period.

**b) Payment to account**

The card is placed in the terminal and PIN code is inputted. Type of transaction is chosen,  
30 whereafter amount, clearing number of the bank and account number are stated. Transfer of the amount to selected account occurs immediately after that the card has been updated with the new information from the bank. Should the card holder interrupt input of the above information, the operation is terminated, and no change is made to the information stored within the card.

35

**c) Transfer from account to card**

This is accomplished substantially as described under b), i.e. the card is placed in the terminal with input of associated PIN code, type of transaction is stated and the amount requested to be transferred to the card. The account associated with the card is charged, and provided that desired amount is available, the card is updated with the new amount  
5 at the same time as the account is charged with transferred amount.

**d) Payment of goods/services in an online-terminal**

The card is placed in the terminal with input of PIN code (if the amount exceeds the limit amount for transactions without PIN code, or if the number of such transactions has been  
10 reached), whereafter the amount in question is approved. As a result, available and stored amount in the card is reduced with the amount of the transaction.

Should purchases have been made via mobile terminals, such purchases being placed in the card log of transactions as well as the log of the mobile terminal, the card information  
15 of such stored transactions is transferred at the same time. It is of no importance from which party the information is transferred first to the bank, since the last reported logged information serves as a verification of the first received, whereby such a transaction is completely verified. However, received information from one party only is sufficient for a secure verification of a completed transaction, since the verification is carried out in a safe  
20 manner.

As well as with online-terminals as transactions via Internet, the information is updated immediately.

**25 e) Payment of goods/services in an Internet shop**

The card is placed in a reader connected to a computer, and the page of the site is chosen where payment should be made. As a first step, the software of the client is synchronized with the software of the shop, whereafter the client inputs the PIN code. Data from the client is sent coded (+128 bits) to the seller, who thereto adds the amount to be paid and  
30 its certificate. Contact with the bank is thereafter established from the seller, which checks the certificate of the seller, amount and client card data. Provided that received information is correct, the bank issues a "claim" with the amount in question calculated based on the currency of the card holder. This "claim" is sent via the seller to the client for verification of the stated amount (this amount is preferably stated in the currency concerned, and  
35 when required, also with rate of exchange). After verification from the client, the client contacts the bank for approval of the amount in question. This certificate from the client is now a "token" which is joined to the earlier "claim" from the bank for verification of

correspondence with each other, whereafter a request for money is sent to the card. The amount is now reduced from present balance on the card and the balance information, in the bank is updated correspondingly. A final certificate is sent to the seller, whereby the related amount is credited the seller, whereafter the transaction is completed.

5

All information mentioned above is preferably transferred strongly coded, which further secures complete safety for each transaction.

It is important, that the above described method of payment results in that the bank is immediately updated with regard to completed transactions, that the card is updated with used amount, that the seller receives verification approving the card, that the customer is allowed to accept the amount and to verify same, and that all parties involved receive verification of the allowed charge, and that money is available for the transaction.

#### 15 f) Blocking of a card

As previously mentioned, there might be reasons for blocking a card when it has been lost, damaged or stolen, and such an operation can be performed manually by the card holder or, under certain circumstances, automatically.

20 As examples of various ways to perform blocking manually can thus be mentioned via a directly connected terminal (by statement of card number and PIN code), by direct contact with the bank, or by identifying oneself in a shop and stating the bank to which the card is associated and/or PIN code. The shop may then, by means of a special program in its terminal for blocking operations, based on stated information perform a blocking operation  
25 for the card in question.

An automatic blocking operation is performed, as previously mentioned, when incorrect PIN code is stated repeatedly, as well as when a card has not been used during a specified period of time.

30

A blocking operation for a card does not involve any mechanical damage to the card, but merely that it is emptied of stored information and program software at the first attempt made to use a blocked card in an online-terminal, whereby stored information is transferred to the bank. The card is thereby erased from the list of barred or blocked cards. It is also  
35 within the scope of the invention to include a memory with such an updatable list of barred or blocked cards in mobile terminals, and at an attempt to use a blocked card store the information from the card in the mobile terminal, and thereby empty the card of stored

information and program software.

In order to secure that a blocked card can not be used for a restricted number of smaller transactions, which do not require PIN code, a user may also choose that a card is issued  
5 for which PIN code is required for every single transaction.

With regard to mobile terminals, it may also be stipulated that transfer of data should be performed within a certain period of time, e.g. 7 days, in order to further increase the safety of the system. For terminals, e.g. in soft drink machines, involving small amounts and  
10 longer service intervals, longer periods of time can obviously be accepted.

**g) Recovery of amount from a lost or damaged card**

Should a user loose his card, the unused amount can, as already previously mentioned, be transferred to a new card. This can obviously also take place should a user's card be  
15 damaged in such a way that it can not be used. As soon as a card is blocked, the new card can be issued, which is linked to the account of the user. A certain amount of the registered balance may initially be reserved by the bank, serving as a guaranteed amount for non-registered transactions performed with the card which has been lost or damaged. After, for example, 2 weeks, reserved amount not used for such transactions can be  
20 transferred to the new card, an operation that can be performed automatically in connection with use of the new card with an online-connection to the bank. This means that a user can collect a new card on the same day as a lost card is blocked, with a possible excess for non-registered purchases charged during a short period of time, which becomes available within a relatively short period of time provided that no non-registered  
25 withdrawals exist for the old card.

**h) Transactions via mobile terminal**

A purchase via a mobile terminal involves certain restrictions in view of the fact that same does not facilitate the same checking system as online-terminals. These should therefore  
30 not allow purchases exceeding a predetermined level of amounts.

Mobile terminals can be used for e.g. soft drink machines, bus and taxi travel, admission to cinemas, car parking and other purposes involving relatively small amounts.

35 An example of an interesting field of use is, for example, the possibility to use a special version of cards within a town as a means of payment for bus travel within public transport. Such a card having, for example, a limited amount of SEK 10 and 25 such transfers, can

be used as a simple system for payment of bus travel. In those cases where return travel or transfer to another bus line is allowed during, for example, one hour, stored data relating to performed payment may also include the actual time for first travel, whereby a new amount is not charged when entering another bus, provided that such a time limit has not  
5 been exceeded.

**i) Transfer between mobile terminal and bank**

As previously mentioned, mobile terminals should be emptied of information at regular time intervals, an action related safety for the customer as well as accounting within the bank.  
10 With regard to mobile systems used e.g. for purchase of tickets on public transport, an emptying operation should preferably be performed on a daily basis, in view of the large number of transactions that may occur.

Transfer can be accomplished by means of a terminal, or by use of a transfer card, which  
15 transfers logged information together with total amount.

In order to obtain maximum security, this information is transferred coded in order to avoid risk for any form of illegal influence. Should the digital signature not be correct, logged information is not accepted, whereby payment is not made to the account in question.  
20 Hereby protection is obtained against unauthorized equipment.

Used equipment for emptying mobile terminals shall of course be in direct contact with the bank to facilitate an emptying operation.

**25 j) Emptying of card**

As already mentioned, a non-authorized or blocked card will be emptied of all information, to the extent possible, when such a card is brought into contact with directly connected equipment, or a mobile terminal having an updated list of blocked cards.  
30 When this occurs, an emptying sequence is initiated, whereby data, and program software, are transferred, preferably coded, to the terminal/bank. The ID-number of the card is also transferred at the same time, and the blocked card can thereafter be removed from the list of blocked cards.

35 For unknown cards, a read routine is initiated by the terminal, arranged to attempt to read as much as possible of stored data and software. The data obtained are encoded and signed by the terminal in question, and transferred as an alarm disclosing that a

manipulation or counterfeiting attempt is in progress.

When the read routines have been completed, the present card is emptied/reprogrammed by initiation of a sequence with "block erase" erasing both data and program software from  
5 the card. This on condition that the card is not identified as a valid card from an issuing authority not participating in the payment system.

Common for all deactivations is, that time, date and terminal number are logged and transferred together with data collected from the card. This facilitates a later analysis of  
10 data obtained, and thereby a possibility to develop protective means against possible attempts of attack aimed at the payment system.

**k) Updating of card**

A card can be updated at any online-connected terminal when this is required. Such an  
15 update may, for example, relate to smaller changes of the program software of the card, or change of the entire program software to a new and updated version, as well as changes to the encoding key or a change from a primary encoding key to a secondary. Such an update should preferably always include a checking operation of present status for the card against the bank, and the bank information is thereafter added to the card, if  
20 such a need exists after the checking operation.

**l) Change of PIN code**

Change of PIN code can only be performed via online-connected terminals, in view of the fact that the bank must be updated with the same information, since utilized encoding keys  
25 preferably are based on an algorithm which partly is based on present PIN code.

It is obviously in this connection an advantage, that a user freely can select a PIN code with a combination of numerals that the user easily can memorize, as well as that change of PIN code can be performed in a rapid and simple way whenever a user so desires.

30

**m) Payment with bank or credit cards via the system**

Should a person not hold a card intended for the payment system according to the invention, but be the holder of a credit, pay or bank card with magnetic strip or a chip system based on the ISO standard, these types of cards can also be used in the system  
35 according to the invention.

For example, payments at distance, e.g. via Internet, involving a card with a magnetic strip, same is inserted into a therefor adapted reader, and stored information relating to card number and issuer are read. After input of PIN code by the user, the data obtained are transferred, preferably encoded, to the seller, which adds the requested amount to the  
5 information, whereafter all information is transferred to the bank and the customer.

The customer verifies the amount and establishes contact with the bank stated on the certificate from the seller, and the bank checks the information from the seller against the information from the customer. A receipt for the present payment is created by the bank,  
10 which directly from the bank, or via the customer, is transferred to the seller as evidence of completed payment.

The purchase is thereby made final, without any information given to the seller regarding the card number or risk for same being communicated to an unauthorized party. The seller  
15 can not change the amount, or make further withdrawals from the card, without the knowledge of the card holder.

By this method all present day risks relating to spreading of card number and associated information of validity term are removed. As a further development of this method, a seller  
20 may also create a system for recognizing customers by fetching the certificate associated with a certain customer, and which can be obtained from the bank. This could, for example, be accomplished by sending card number together with PIN code to the bank, which in response informs of the certificate number for the customer.

25 Such a certificate number only gives reference to a certain specific customer, and can not be used by a seller to create payments, since information relating to a payment must consequently be verified by the terminal of the buyer, since this traffic (verification) does not run through the system of the seller.

30 Furthermore, each payment receives an encoded serial number, which means that for each payment a unique one time certificate is created, which is issued by the bank. A seller can only read the information related to and required for the seller with regard to each individual transaction.

35 For direct payments, e.g. in a shop, stored data can be read and this can be transferred together with the amount of the purchase via online-connected terminals in a manner substantially corresponding to the terminals used today for this purpose.



The terminals utilized for the payment system according to the present invention have already been partly described with regard to functions, but examples of embodiments that can be used will hereinafter be briefly described.

- 5 1. Personal terminals, which comprise a relatively very simple card reader including a write function for connection to a personal computer via USB, serial port or as an internal system unit (e.g. connected similar to a floppy disk unit or a CDRW-unit). It is controlled via associated program software in the computer, preferably via a WEB-based interface, in which case the program code preferably is written in Java;  
10 or C/C++, and in the latter case as a plugin to the web reader. A completely self-contained program can obviously also be used. Any system-api should never in any case be supplied for the clients and the code should be closed.
- 15 2. Shop terminals, including a keypad with display unit, which, for example, may comprise of a simple LCD-display. The terminal is preferably arranged with a serial port or similar means of connection facilitating co-action with a cash register system, whereby information relating to the amount of a completed purchase can be sent to  
20 the terminal, and the cash register system can also register information from the terminal relating to transaction number for information on the receipt. The terminal is communicating via modem or any other method of connection (e.g. lan-gan, ISDN, analogue) for direct verification of larger amounts, as well as (when sufficient  
25 memory capacity is available) for maintaining the blocking lists of the system. The protocol for communication between shop terminal/cash register system is assumed available according to an open standard in order to facilitate development of cash register systems adapted for use with the system. As previously mentioned, these  
30 terminals may advantageously include a card reader for conventional credit, pay and bank cards having a magnetic strip, as well as program software for handling other types of cards having a micro processor, e.g. CashCard, whereby only one terminal is sufficient for all types of presently existing systems for card payment. This can also be implemented in other types of terminals than shop terminals.
- 35 3. Bank terminals, having a basic concept similar to the above described personal terminal (1), but with further specially adapted program software facilitating the functions which are specific to banks.
4. Outdoor terminals having keypad and LCD-display, which facilitate performance of simple functions, such as loading the card with a new amount, card-to-card

transactions, as well as blocking of cards (can be performed with knowledge of card number and PIN code).

5. Mobile terminals, which are a special type accepting smaller payments, since no possibility exist for direct connection to central systems. Performed transactions are stored in the mobile terminal, and can be emptied via transfer cards, terminal or via an existing serial port, USB-port or similar. Such terminals, as well as other types of terminals, may also via IR-connection, galvanical circuit electrical connection, or any other known method, be arranged to facilitate use of a mobile telephone system as means of communication. Hereby, e.g. occasional single payments of large amounts, may also be accepted and directly verified via a mobile terminal.

The above described examples of cards, functions and terminals are only intended to disclose basic and non-restricting examples of embodiments within the scope for the payment system according to the invention, and to disclose ways in which they can be implemented. It is thus believed to be within the knowledge of a person skilled in the art to create necessary program software to accomplish described functions, as well as to design the terminal described herein and which construction can be varied in a number of different ways utilizing techniques known within the field.

Any examples of suitable encoding algorithms have not been given, partly in view of the fact that knowledge of such algorithms should not be published, partly since examples of how a number of such algorithms are built up and work are previously known. In this connection it has only been stated, that same should preferably be of the type with at least 128 bits, and that the system should preferably include a primary and a secondary algorithm, and that utilized PIN code consists one of the elements for encoding.

The payment system according to the present invention is thus in no way restricted to the examples of embodiments herein described, which means that a payment system according to the invention may include less as well as more functions than what has been described, within the scope of the inventive thought and the following claims.

CLAIMS

1. Payment system utilizing so called "smart cards", which include a microprocessor attached to the card with associated memory circuits for storage of program software and transactions, and which via a terminal can be supplied an available and for the card holder useable amount, from which reduction can be made via a pay terminal when the card is used as a means of payment, and that a unique card number for said card, together with a PIN code registered for the card, are transformed by means of the card micro processor into a unique user certificate for each individual card, which is used for verification of the authority of the user, c h a r a c t e r i s e d i n,

that said card includes stored information relating to a maximum level of amount to which the card can be used without stating PIN code, and information relating to the maximum number of such transactions that can be performed without the card communicating and transferring information of executed transactions to the bank holding the account or similar party, such transactions being registered and stored in the memory circuits of the card with a corresponding reduction and storage of remaining available amount and remaining number of allowed executable transactions;

20 that said card when used in connection with payment terminals not communicating on-line performs storage of transaction data in the memory circuits of the card as well as in the payment terminal; and

that said card, when inserted into a reading terminal having direct connection to the bank holding the account or similar party, performs transfer of stored transaction data in the card for registration/checking recorded transactions with said bank or similar, and that preferably also at the same time limit values for total number of transactions allowed without stating PIN code, as well as maximum total amount limit for such transactions, are updated/restored.

30

2. Payment system according to claim 1, c h a r a c t e r i s e d i n, that same additionally includes the steps:

that insertion of a non-valid card in a directly communicating terminal, or a non-directly communicating terminal having memory stored bar list information relating to blocked cards, results in transfer to the terminal of stored transaction information in the non-valid card, as well as available program software on the card, which completely or partly is

stored in the terminal, or at a directly communicating terminal, is transferred via the terminal;

that as a successively following step said information/program software as substantially  
5 as possible is erased from the card; and

that said obtained information as soon as possible is transferred to the account holding bank or similar with information relating to the identity of the terminal and the time when the action was performed.

10

3. Payment system according to any one of claims 1 or 2, characterised in, that same additionally includes the steps:

to facilitate transfer of an amount between two cards with use of a terminal included in the  
15 payment system, whereby a first card as an initial step is placed in a terminal with input of type of transaction, PIN code and intended amount;

that as a following step verification is performed of card and PIN code, requested amount is reserved, and a time restricted certificate is created for the terminal used;

20

that the second and receiving card is placed in the terminal within a predetermined time period with input of the PIN code for the second card, whereby the amount in question is transferred and registered as a completed transaction; and

25 that should the second and receiving card not be placed in the terminal within said predetermined time period, the transaction is annulled as not completed.

4. Payment system according to any one of the preceding claims, characterised in, that same additionally includes the steps:

30

to facilitate payment from card to any desired bank account by placing the card in question in a terminal connected to the system with input of PIN code;

that amount, clearing number of receiving bank and recipient's account number is inputted;

35 and

that the amount stated thereby is transferred to requested account and that available

amount on the card is reduced with the corresponding amount.

5. Payment system according to any one of the preceding claims, characterised in, that same additionally includes the steps:

5

to facilitate payment via Internet or similar by placing the card in a card reader connected to a computer with related program software;

that used program software in a following step preferably is synchronized with the program

10 software of a seller, with whom the computer is communicating;

that the PIN code of the card is stated, and that based on card data and PIN code an encoded certificate identifying the holder of the card is transferred to the seller;

15 that the seller adds to received encoded certificate information relating to the actual amount to be charged to the buyer, and transfers this information to the account holding bank or similar;

that said account holding bank or similar, after checking the authority of card holder and  
20 seller, issues a preliminary certificate (claim) relating to the transaction, which via the seller is transferred to the card holder;

that the card holder from said certificate receives information concerning at least the amount in question, and that the card holder in order to finalize the purchase directly to the  
25 account holding bank or similar transfers received preliminary certificate verified as approved (a token); and

that the account holding bank or similar performs a checking operation relating to correspondence between earlier "claim" and received "token", and if correspondence is  
30 established on one hand reduces existing amount on the card, and on the other hand transfers a certificate to the seller, who is thereby credited the amount in question.

6. Payment system according to any one of the preceding claims, characterised in, that same additionally includes the steps:

35

to facilitate payment via Internet or similar to a seller who has previously stored information relating to the unique identity (certificate) of a certain card holder by the placement of the

card in a card reader connected to a computer having associated program software, and that utilized program software in a following step is preferably synchronized with the program software of the seller, with whom the computer is communicating, and that the PIN code of the card thereafter is stated, whereby based on card data and PIN code an encoded and the card holder identifying certificate is transferred to and stored by the seller;

the seller to previously stored encoded certificate adds information relating to the present amount to be charged to the buyer, and transfers this information to account holding bank or similar;

said account holding bank or similar, after having performed a checkup of the authority of card holder and seller, issues a preliminary certificate (claim) related to the transaction, which via the seller is transferred to the buyer;

whereby the card holder from said preliminary certificate receives information of at least the present amount, and to finalize the purchase directly to account holding bank or similar transfers received preliminary certificate verified as an approval of the transaction (a token); whereafter

the account holding bank or similar performs a checkup regarding correspondence between earlier "claim" and received "token", and if correspondence is established on one hand reduces existing amount on the card, and on the other hand transfers a certificate to the seller, who is thereby credited the amount in question.

7. Payment system according to any one of the preceding claims, characterised in, that same additionally includes the steps:

to facilitate blocking of a card at any terminal within the payment system by inputting the identifying number of the card and associated PIN code;

that the card identifying information is added to a blocking list;

and that preferably substantially the total available amount for the blocked card is returned to the account of the card holder or to a new card issued to the card holder.

8. Payment system according to any one of the preceding claims, characterised

in, that same additionally includes the steps:

to facilitate transfer of data from a terminal not communicating on-line via transfer card having memory capacity for the transaction data stored in the terminal not communicating  
5 on-line, said data being transferable to account holding bank or similar by means of a terminal connected to the system.

9. Payment system according to any one of the preceding claims, characterised  
in, that same additionally includes the steps:

10

that a card holder using any terminal connected to the system by insertion of the card and input of associated PIN code is given the possibility to change registered PIN code.

10. Payment system according to any one of the preceding claims, characterised  
15 in, that same additionally includes the steps:

that for a certain geographical area program the card for a certain number of cost units related to public transport, which can be used without PIN code being required;

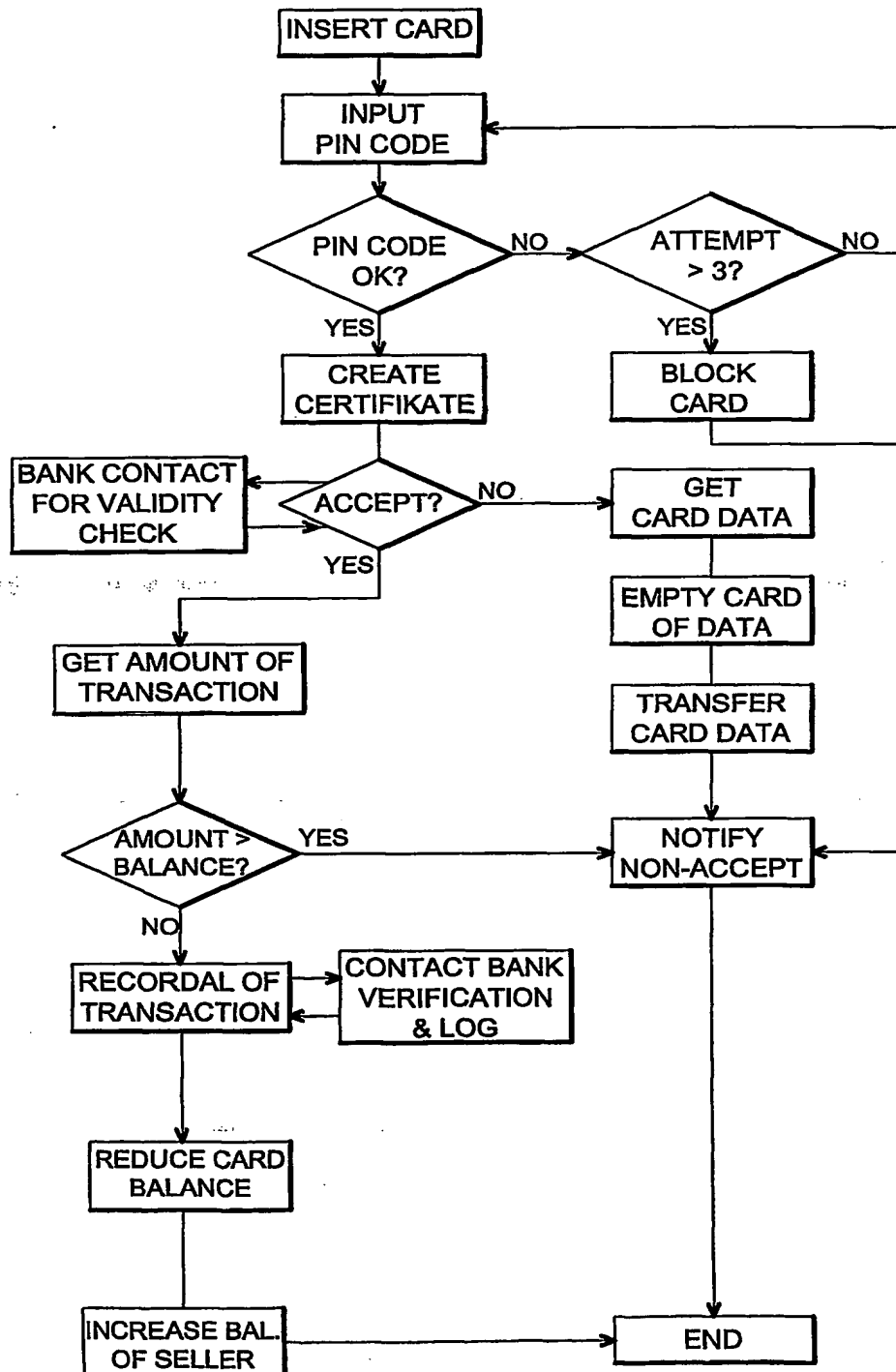
20 that the public transport company utilizes card readers which read whether or not travel has commenced during a predetermined period of time, and if so, accepts earlier made charge to the card as payment, thereby facilitating continued travel free of charge during said predetermined period of time.

25 11. Payment system according to any one of the preceding claims, characterised in, that verification of the validity of a card also includes the step:

to check if the card has not been used during a predetermined period of time, e.g. 12 months, and at attempts to use such an unused card block and empty same of stored data  
30 and accessible program software.

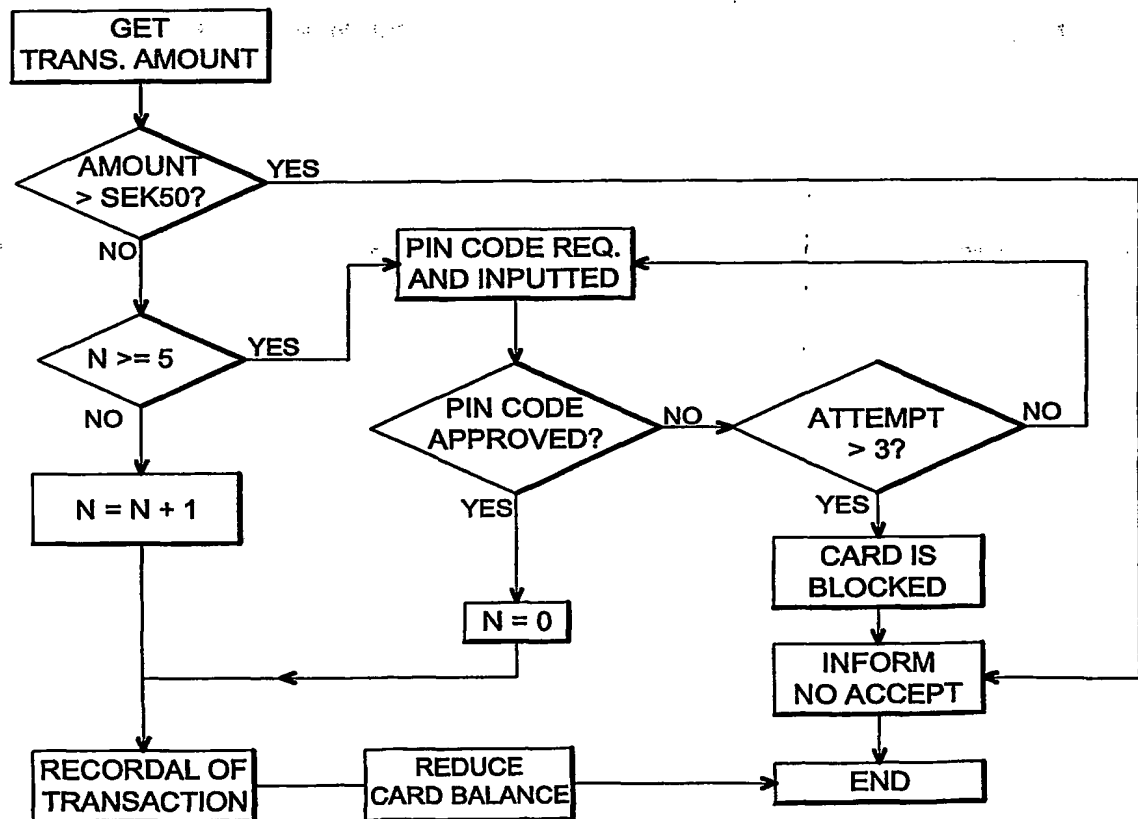
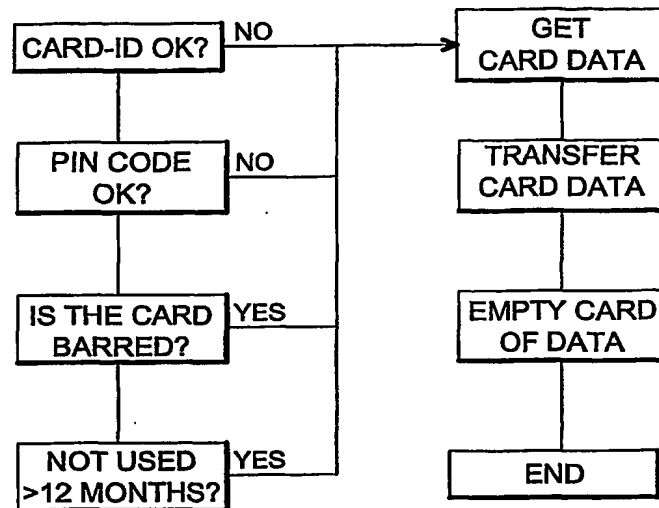
12. Payment system according to any one of the preceding claims, characterised  
in, that on receipt of data from a terminal included within the system indicating a user with a card related to another payment system, e.g. credit, pay or bank cards with information  
35 stored in a magnetic strip, independently or via switching through to the system in question, also give acceptance to such verified and accepted cards as approved means of payment within the system.

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**Fig. 1**



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**Fig. 2****Fig. 3**